Hegeler Institute

Actions Versus Functions: A Plea for an Alternative Metaphysics of Artifacts
Author(s): Wybo Houkes and Pieter Vermaas
Reviewed work(s):
Source: *The Monist*, Vol. 87, No. 1, On Function (JANUARY 2004), pp. 52-71
Published by: Hegeler Institute
Stable URL: http://www.jstor.org/stable/27903855
Accessed: 01/06/2012 00:53

Your use of the JSTOR archive indicates your acceptance of the Terms & Conditions of Use, available at
http://www.jstor.org/page/info/about/policies/terms.jsp

JSTOR is a not-for-profit service that helps scholars, researchers, and students discover, use, and build upon a wide range of content in a trusted digital archive. We use information technology and tools to increase productivity and facilitate new forms of scholarship. For more information about JSTOR, please contact support@jstor.org.

Hegeler Institute is collaborating with JSTOR to digitize, preserve and extend access to *The Monist.*

http://www.jstor.org

Actions Versus Functions: A Plea for an Alternative Metaphysics of Artifacts*

The philosophy of artifacts is as marginal as it is one-sided. The majority of contributions to it are asides in works devoted to other subjects and focus on one characteristic feature: that artifacts are objects with functions. Indeed many artifacts, such as screwdrivers and toasters, come in functional kinds. Perhaps for this reason, philosophers elevated functions to the essences of artifacts[1] or have developed general theories of function to describe artifacts along with their main subject: biological items. Most such theories present one monolithic notion of function that applies to both. Dissident voices claim autonomy for artifact functions, or at least a small measure of conceptual independence, but it is seldom questioned that a theory of artifacts consists merely of a theory of artifact functions.

Seldom, but not never. The only monograph that devotes a substantial part to a theory of artifacts, Dipert (1993), takes another starting-point, namely the connection of artifacts with intentional action. In line with this approach, this paper presents two arguments to the effect that an adequate theory of artifacts should fundamentally be a theory of 'artifact actions', i.e., a theory of using and designing.

Most of this paper is devoted to the first, phenomenological argument. In Section 1, we attempt to show that theories of functions have difficulty accounting for a salient characteristic of the phenomenology of artifact use—the common distinction between standard use and alternative or improper use. This suggests that a theory of functions ought to be at least supplemented and perhaps even replaced with something else, and it suggests focusing on using instead of functions. Then we briefly present a theory of artifact use and design that we have developed elsewhere (Section 2) and we show that this theory leads to a richer and more adequate account of the phenomenology than a function-centered approach (Section 3).

"Actions Versus Functions:
A Plea for an Alternative Metaphysics of Artifacts" by Wybo Houkes & Pieter Vermaas,
The Monist, vol. 87, no. 1, pp. 52–71. Copyright © 2004, THE MONIST, Peru, Illinois 61354.

Instead of conceptualizing the phenomenology of using in terms of types of *functions*—proper and accidental—our theory fundamentally distinguishes types of *use*—standard, non-standard, rational, and irrational—on the basis of plans. In Section 4, we sketch how a theory of artifact functions can be derived from our action-centered approach, thus supplementing our first argument with a second, conceptual one. Finally, we draw some conclusions about the metaphysics of artifacts by means of this conceptual argument. These conclusions are meant to undermine the received view that functions are the essence of artifacts, and thus meant to start the search for a more satisfactory metaphysics of artifacts.

1. Standard and alternative use in a theory of functions

Artifact use has a rich phenomenology. Philosophers have discussed some aspects: Heidegger's *Sein und Zeit* contains an elaborate description of the relatedness of artifacts in use, and Merleau-Ponty emphasized that artifacts, in use, often serve as extensions of our body. In this paper, we would like to focus on another aspect of the phenomenology, namely the existence of standard, alternative, and improper uses of artifacts.

To give but a few examples of this distinction: chairs are for sitting on, not for using as a foot-stand in painting one's ceiling—although this standard is less sharp or urgent for a dinner-table chair than for a rocking-chair. A magnifying glass is, as the name indicates, for studying small objects, although it has a generally accepted alternative use in causing small fires; in fact, virtually indistinguishable objects are sold as burning glasses. An oven is for baking, although it heats the kitchen while doing so and hence may serve to warm the hands of a dinner guest who just came in from the cold.

There is nothing special abut chairs, magnifying glasses, and ovens in this respect. With the possible exception of *impromptu* devices, artifacts have standard types of use, and all artifacts can be used in multiple ways. Furthermore, some alternative uses are valued, or may have the status of clever tricks—such as removing candle wax from clothes by covering them with brown paper and ironing them, which is a clever use of both paper and iron. Other alternative uses are discredited as "improper," for instance, in the void clause of many warranties—microwaves are, anecdotally, not to be used for drying lap-dogs. One task for a philosophy of artifacts is therefore to explain or underwrite these distinctions between standard and alternative and between improper and acceptable alternative use; it is too

widespread and intuitively, not to mention legally, important to discard as a figment of unschooled intuition. This is not to say that conceptual analysis or a philosophical reconstruction should leave the *prima facie* distinction intact; a secondary goal of a philosophy of artifacts could be to point out subdivisions within and sliding scales between both rough-and-ready categories. Yet the primary goal should be to conceptualize the distinctions as such.

At first glance, function-oriented philosophies of artifacts seem to have resources needed for this task. Clearly, people do not often speak about artifacts in terms of their functions. They may say that it serves a purpose, that it is of use, or that it is "to . . . " or "for . . . ," but one seldom hears someone claim that a pen "has the function" to write with. This applies to designers as well as users. Designing is sometimes characterized as translating function into structure or form, but one finds little usage of the term 'function' in, for instance, patents or engineering textbooks. Yet statements on standard and alternative use are straightforwardly *reformulated* in terms of functions. For instance, a chair has the function to sit on, although it may be used for different purposes. In this way, the distinction between standard and alternative use is rephrased as one between use that is and use that is not in accordance with an artifact function. More ambitiously, the entire distinction may be transferred from the domain of use to that of functions. Then, one may say that a chair has the *proper* function to sit on, although it may also have the *accidental* function to stand on. Standard use can be explained as employment of a proper function of an artifact, whereas in alternative use accidental functions are employed. In that case, alternative uses enter the analysis only as complements of the main *analysandum* of function-oriented accounts—the proper function of artifacts.

There are many theories in the literature that provide a basis for an analysis of types of uses of artifacts in terms of proper and accidental functions. One of the earliest places to find the latter distinction is Larry Wright's seminal paper on functions.[2] Ruth Millikan presents her theory as one of proper functions, in contradistinction to accidental functions or "functioning as."[3] More recently, Beth Preston formulated a theory that makes a distinction between proper functions and *system* functions, and has explicitly extended it to the realm of artifacts.[4] This is perhaps the clearest example of analyzing types of use in terms of types of functions.

In short, "function talk" is part of a philosophical reconstruction of ordinary practice, linguistic and non-linguistic. Functions are *prima facie* no more natural candidates for such a reconstruction than other concepts, but they may be more successful. Yet once we take a closer look at the distinctions at hand, problems arise for a function-oriented approach. In the remainder of this section, we draw attention to three troublesome aspects of the phenomenology of using artifacts.

A preliminary point is that, as it stands, the function-oriented strategy yields only one resource: a sharp distinction between proper and accidental functions. Some actual or non-actual features of an artifact that are somehow "marked" as privileged are the basis of its proper functions; others—possibly all remaining features of the artifact—are the basis for accidental functions. Functions live, so to say, in a class society: a limitless proletariat of accidental functions and a select elite of proper functions.

This resource cannot cope with the many gray-tones of the distinction between types of use. Here, we present just three: the difference between types of alternative use, the dynamics of standard use, and the difference between use by agents and the behavior of objects.

First of all, existing theories of function make no distinctions within the class of accidental functions. This is forgivable for the biological case, in which there does seem to be a sharp dichotomy between evolutionarily selected capacities and other causally effective capacities of organs, behavior, and organisms. For technical artifacts and their use, however, things are not as clear-cut. That a rocking-chair is not for standing on already seems a statement of a different category than that a dinner-table chair is not for standing on. Moreover, some alternative uses are taken as acceptable and others as improper. Hence, analyzing alternative use simply as employment (or ascription) of an accidental function is phenomenologically impoverished. Yet, as it stands, the function-oriented strategy offers no distinctions besides that between proper and accidental functions.

Secondly, the standard use of artifacts is not historically fixed, but may change over time. The history of technology abounds with artifacts that were designed for a different purpose than that for which they were used later. This phenomenon is acknowledged in some papers on artifact functions. Beth Preston, for instance, describes the use of beer as slug bait by organic gardeners, which has slowly evolved as a practice alongside

use as a beverage.[5] It is conceivable that someone would start a small brewery especially to make anti-slug beer. In that case, the standard type of use would presumably change. There are also many cases of artifacts for which new supplementary uses have been developed or for which alternative uses have replaced the original standard use. Aspirin, to give another example, has recently been promoted as, among other things, a drug to prevent cardiovascular problems. This use, which involves taking the ordinary Aspirin tablets at a different dose, co-exists peacefully, so to say, with the original use of Aspirin to alleviate pain and reduce fever. These scenarios can be described in terms of proper and accidental functions: Aspirin tablets and beer always had the accidental function of preventing blood clots and attracting slugs, respectively, which have recently been "promoted" to the status of proper functions. This shows at the very least that functions are relational properties; after all, the underlying physicochemical properties of Aspirin and beer did not change. But what are they related to? In both cases, the main reason to promote accidental functions to proper status appears to be redesign (possibly in the trivial sense of changing the purpose of their production) or change of socially established use. There appears to be no change on the object-side, i.e., in the physical properties, of artifacts, but only on the designer- or user-side. Formulating this change in terms of relational properties of the objects in question is not obviously wrong or inadequate, but if the relational nature of functions is not clearly brought out, it is at least misleading.

Finally, theories of functions may have difficulty with making a distinction between use of an object by agents and mere behavior of that object. Absentmindedly putting a magnifying glass on a shelf, where it causes a small fire, is not accidental use of the artifact as a burning glass—in fact, one would be hard put to describe it as use at all, given the possible legal consequences of such a description. If theories ascribe accidental functions to artifacts on the basis of all the capacities of the artifacts, the magnifying glass can be ascribed the accidental function to cause fire. This mishap can then be taken as the employment of an accidental function and thus as alternative use of the glass instead of mere behavior.

So if alternative use is described as the employment of accidental functions, it cannot be the case that every actual capacity of an artifact gives rise to an accidental function of the artifact. Conversely, it also does not hold that every accidental function of an artifact is ascribed on the basis of an actual capacity. The use of a horseshoe as a talisman may be

considered alternative (relative to its standard use to protect the feet of horses). But the accidental function to turn away evil spirits that corresponds to this use it is not based on an actual feature of the artifact.[6] Hence, more generally, if alternative use is described as the employment of an accidental function, then actual capacities are neither necessary nor sufficient for ascribing accidental functions. Actual behavior of an object has some relation to standard and alternative use by agents, but the connection is complicated and variegated—and the complexities lie, once again, on the agent or use side rather than on the object side.

All these aspects of the phenomenology suggest that standard and alternative use cannot be described in terms of proper and accidental functions alone; these concepts have to be at least supplemented with an analysis of using and designing. In the remainder of this paper, we explore this route.

2. *Use plans and practical rationality*

Our alternative to the function-oriented approach is to analyze using and designing immediately in terms of actions. In this section, we present the main features of our reconstruction[7] of these two types of "artifact actions." Central to our action-theoretical analysis is the notion of a use plan. Defining a plan somewhat loosely as a goal-directed series of considered actions, a use plan of object x is a series of such actions in which manipulations of x are included as contributions to realizing the given goal. This is a rough-and-ready characterization sufficiently precise for the purposes of this paper.

Let us give an example of a use plan and the role that it plays in using. Suppose I would like to send a message to a friend, in order to tell her that I will be meeting her in a restaurant this evening. Converting this desire into a stable intention may involve planning, i.e., deliberating about how to realize the content of the desire.[8] In this case, various scenarios suggest themselves. I could walk to my friend's office and tell her personally; I might send her an e-mail; I might phone her at home, knowing that she is at work, and leave a message at the answering device; etc. The possibilities, even those within the bounds of practical rationality, are legion.

Any of these scenarios may be labeled a plan. The first plan, walking to the office, consists of a number of actions, none of which involves the manipulation of an object other than my body. The second plan, however,

involves manipulation of a computer. Hence, we call this series of considered actions (roughly: starting relevant software, looking up the address of my friend, composing a message, and hitting the "send" button) a use plan for my computer. The third plan involves manipulation of two objects, my phone and my friend's answering device. Our characterization of use plans is liberal in that it allows us to say that this plan is consequently a use plan for both the phone and the answering device.[9]

The role of use plans in designing artifacts can be explained on the basis of their role in the use of artifacts. After deliberating about how to achieve his goal by means of manipulations of an object, an agent settles on a use plan for that object. The user can construct this use plan autonomously or he can opt for a pre-existing plan. Drivers do not deliberate autonomously about the way to use their cars. While taking driving lessons, they have received instruction in a use plan and they follow this plan, or something like it, throughout their careers as drivers.

On the basis of this characterization of using, designing can be modeled as a sequence of actions that involves the construction of a use plan as well as the description of a type of artifact. The latter is usually taken to comprise the whole of designing, neglecting the importance of the designed and communicated use plan. On our reconstruction, designers aim at aiding prospective users in bringing about a certain goal state. Developing a sequence of actions to be undertaken by users and communicating it to them (via user manuals, explicit instruction, television ads, product demonstrations, features of the artifact, known habits and cultural patterns, etc.) is central to such assistance; perhaps even more central than describing novel objects that are to be manipulated in the course of these user actions. This does not entail that designers always deliberately develop a use plan for their designed artifact. For many artifacts, such as new types of cars, the use plan is almost completely fixed by custom: the designer cannot stray far from the beaten track. In other cases, designers will make non-deliberate, unconscious, or even outright bad choices about the use of an artifact. But even in these cases designing does involve the choice, although perhaps not the conscious development, of a use plan.

Two major advantages to this plan-based reconstruction of artifact actions are of immediate relevance for this paper. First, there exist standards of rationality for plans. Second, a theory of artifact functions can be derived from a plan theory of artifact actions. In this section, we present the former

advantage, which leads to our account of the phenomenology of artifact use, in Section 3; the latter advantage, which supports our second, conceptual argument, is left to Section 4.

Plans are subject to evaluation. Although such judgments are highly context-sensitive, a plan may be judged more or less appropriate, efficient, effective, or in one word: rational. Furthermore, plans are assessed as wholes, not in terms of their constitutive intentions or considered actions. This holistic evaluation is a major reason to group such actions into more encompassing mental entities. One considered action included in a plan may be sub-optimal, perhaps even detrimental, with respect to the goal, but it may nevertheless contribute to a plan that is rational as a whole. Injecting a healthy person with a virus in order to cause immunity, or placing chairs on top of a table as part of spring-cleaning are cases in point. Hence, plans are not "normatively reducible" to their component actions.

In the literature, several standards for plans have been pointed out. One of the most straightforward standards is that execution of a plan should be likely to lead to the desired state of affairs, or at least more likely than execution of other plans or doing nothing. This standard of "appropriateness" of a plan can be formulated in terms of a calculation of utilities of several available plans.[10] Other standards include "means-end coherence," which requires the person who executes a plan to obtain necessary means (such as slices of bread for making toast) and to develop subplans for obtaining and using these means, and "belief coherence," which means that a plan should be based on beliefs held by the person realizing it.[11]

The latter standard expresses another advantageous trait of plans: That they draw on substantive and varied cognitive resources. In deliberating about the manipulation of objects, i.e., in constructing or adopting a use plan, many different beliefs are relevant for reconstructing the cognitive influence of the user's environment—hence the context-sensitivity of the standards for plans. In a rational plan, the user believes that the selected objects are available for use—present and in working order—that the physical circumstances afford the use of the object, that auxiliary items are available for use, and that the user herself has the skills necessary for and is physically capable of using the object. Therefore, the single standard of belief coherence discredits as (defeasibly) irrational using a car that one believes to be broken, using it in the middle of a blizzard or sleet storm, using it while believing it is out of gas, and using it while one is perfectly

aware that one does not have a driver's license or that one is under the influence of alcohol. Listing a handful of beliefs does not, of course, exhaust the relevant circumstances, so the assessment of plans remains highly defeasible.

3. Plans and types of use

In the previous section, we argued that using and designing can be described in terms of what we called use plans, for which standards of rationality exist. In this section, we show how to account for the phenomenology of standard and alternative use in terms of plans. Combined with the failure of function-oriented approaches discussed in Section 1, this completes our phenomenological argument for an action-oriented approach in the philosophy of artifacts.

As said earlier, the use plans executed in using artifacts may be either constructed by the user herself or drawn from a set of available alternatives. These alternatives may have been constructed earlier by the user, but most have probably been communicated to her by others, explicitly or through customization. The number of plans autonomously constructed by individual users is bound to be relatively small—we learn from others how to use toasters, pneumatic hammers, and bicycles. There seem to be three important sources of use plans for a user. First, innovative fellow users may invent clever use plans, such as removing candle wax by ironing with brown paper. Second, groups or traditions of users construct use plans gradually through processes of trial and error, e.g., the use of salt and sugar in preserving foodstuffs. And finally, designers produce use plans, which are likely to be grounded in scientific knowledge, e.g., in designing cellular phones.

The concept of standard use can be explained straightforwardly by maintaining that a use plan that stems from the last two sources, i.e., communicated traditions and designing, holds a privileged position in the set of available plans. Standard use of an artifact is then the execution of a plan approximately identical to the designed or traditional use plan; i.e., a plan that has at least the same goal and contains approximately similar actions.[12] By contrast, non-standard use is the execution of a plan of a different type than the designed or traditionally evolved one, e.g., a plan devised by the user herself or one that is made up by a fellow user.[13]

Note that this distinction between standard and non-standard use is a gradual one. The first times gardeners employed beer according to the newly devised plan for catching slugs, this use most probably counted as non-standard.[14] But after a "sufficient" number of communications to new users (and of slugs caught) use according to this plan becomes standard. Note also that this is a merely descriptive statement. The standards of rationality are the only available sources of plan assessment available thus far and they do not support a *prima facie* negative evaluation of non-standard use. Indeed, as the phenomenology shows, the plans underlying non-standard use need not be irrational. In fact, many cases will reflect autonomous, context-sensitive deliberation by users—e.g., the selection of a specific object for a one-shot task. An adequate account of the phenomenology should leave room for a positive evaluation of use plans that have not been developed by the designers of an artifact. Distinguishing standard use from *rational* use allows us to categorize, say, the use of a screw-driver to open a paint can as non-standard, but rational. Conversely, standard use may be irrational. After all, there is no guarantee that using a specially designed object will lead to the desired result, even if one follows the instructions in the user manual and makes sure that the artifact is in working order. Designers may fail to develop a use plan that is rational in the circumstances for which they developed the artifact.[15] The standard/non-standard and rational/irrational distinctions are conceptually independent.

By employing these independent distinctions, our plan theory outperforms function-directed philosophies of artifacts with respect to the phenomenology of standard and alternative use presented in Section 1. We will show this by discussing the aspects of the phenomenology that we earlier listed as problematic.

The first problem raised for function-directed accounts of use is their inability to make distinctions within the class of alternative use. The use of rocking-chairs and dinner-table chairs as foot stands are both alternative but intuitively different. Some alternative uses—of irons and brown paper to remove candle wax—are accepted as clever, others—drying dogs in microwaves—are improper. Function-directed accounts lump these examples together as the employment of accidental functions; on our account, as indicated above, any alternative use is non-standard use and we can distinguish types of alternative using in terms of rationality. In this way, we

can explain the intuitive differences between the use of a rocking-chair and a dinner-table chair as a foot stand as a difference in the rationality of using these chairs as means to reach higher. Clever alternative use can be taken as non-standard use that is rational, perhaps in some surprising way. And, as a first approximation, improper use can be characterized as non-standard irrational use. In practice, there is a defeasible reason for collapsing the distinction and calling any alternative use "improper" (and thus for being surprised by rational alternative use). Given our limited cognitive resources, it is rational to make a division of labor, in both theoretical and practical matters. The development of use plans is only one example of procedures in the scope of this meta-strategy. It is unfeasible to develop all of one's use plans autonomously, all the more so given the vast amount of scientific knowledge on which many artifacts and their use plans are based. Users expect designers to have and apply such knowledge and remain on the whole blissfully ignorant of the workings of laptop computers, power networks, and glass-fibre cables. For these high-tech artifacts and perhaps also for simpler ones, standard use is advisable: designers can be expected to have given the development of corresponding use plans more thought. Furthermore, standard use is usually subjected to rigorous testing and may therefore be reasonably expected to lead to its prescribed goal. These two reasons—the broader knowledge base and the history of testing—appear to warrant the use of the normative term 'proper' for standardness, which is a (merely factive) similarity of the use plan developed by the designer and the plan executed by the user.[16]

The second problematic aspect of the phenomenology is the dynamical nature of standard use. If one only has recourse to a distinction between proper and accidental functions, changes in use of artifacts must be described as the elevation of an accidental function of the artifact to "proper" status by some appropriate mechanism. There is no *a priori* reason to suppose that this analysis will fail. Yet the two major theories of function currently in play, the etiological and causal-role theories, both have trouble coping with the dynamics of use. For most etiological theories, the long-term reproduction history of artifacts is the basis of their functions.[17] Features that have not been subject to this long-term reproduction only have accidental status and acquire proper status after multiple reproduction steps. Their narrow focus on reproductive mechanisms makes standard etiolog-

ical theories incapable of accounting for these innovative function ascriptions. This shortcoming is usually ignored for the biological case, but it seems too pressing for the technological case to wave aside. The causal-role theory by Robert Cummins regards as functions those capacities of items that contribute to a capacity of a more encompassing system.[18] It is notoriously unable to make a distinction between proper and accidental functions, given its liberal notion of 'system'. One consequence is that it cannot describe the elevation and degradation of features; they all had the same status to start with. Finally, combinations of both theories, which have recently become *en vogue*, are just as unsuccessful. Combinations that attempt to reduce one theory to the other are non-starters with respect to the current problem, as they inherit the incompetence of their favorite. Only pluralistic accounts, which subdivide the notion of function, stand a chance. These, however, merely displace the problem. By regarding the causal-role theory as the basis for accidental functions and the etiological theory as the basis for proper functions, for instance, the elevation-degradation dynamics is turned into an intertheoretical one. The problem becomes one of explaining how and why a function that was defined by one theory is later defined by the other.

Our action-oriented approach offers more opportunities to describe the dynamics of use. Initially, only use of an artifact that is in accordance with an original designed or traditional use plan is regarded as standard. Users may, however, develop their own use plans for the artifact, by trial and error—as in the beer-as-slug-bait example—or as professional redesigners—as in the Aspirin-as-preventing-blood-clots example. In the course of time, these non-standard plans can be proven successful by actual use and they can be communicated, intentionally or by accident, to other users. Eventually, they can be as well-established as the original use plan and use in accordance with them becomes, by our definition, standard use. Moreover, the original and the newly established standard plans can co-exist peacefully, unless original and new use interfere. The historical development of plate armor is a case in point. In Renaissance Europe, heavy armor evolved from a protective device into a symbol of the noble status of its bearer. To indicate this status, armorers frequently used precious metals and other expensive materials, increasing the armor's weight without improving its protective value. Here, we see the rationali-

ty of the original standard-use plan—wearing the armor in battle—being undermined by the new standard plan—wearing the armor for parades. Consequently, one use slowly replaced the other. Of course, the mechanisms of division of labor and of the communication of use plans have to be specified further before our action-oriented approach adequately accounts for the dynamics of use. Yet it offers a natural and promising place to start.

Finally, our action-theoretic account distinguishes alternative use of an object by agents from mere behavior of that object. Not any employment of a capacity of an artifact gives rise to alternative use: Using reflects a use plan of an agent, based on explicit beliefs about the artifact. This puts a natural, though not very sharp, limitation on the class of alternative uses. Using a chair as a foot stand is alternative use, its casting a shadow is typically a mere causal effect. *Vice versa*, alternative use is not necessarily based on capacities of the artifact. The use of a horseshoe to ward off evil spirits is embedded in a use plan, based on *beliefs about* the properties of the horseshoe; beliefs which most of us hold to be false. Given the lenient standard of belief coherence, this alternative use cannot be discredited as irrational. Doing so would require the imposition of additional conditions on the relevant beliefs—such as justification. Nevertheless, making the standard of belief coherence more stringent still leaves a gap between the cognitive states on which plans are based and the actual capacities of manipulated objects. The notion of accidental function, as it stands, neglects this gap; our account does not.

4. The metaphysics of artifacts and their functions

The argument presented in the previous sections shows that an action-oriented philosophy of artifacts adequately describes a central aspect of the phenomenology of artifact use, which is problematic for function-oriented philosophies. Nevertheless, we have not proven that this phenomenology *cannot* be accounted for in terms of functions. And it is hard to see how such a proof could be offered, since one could straightforwardly distinguish as many types of functions as we distinguish types of use. Our contention is that such an intra-functional approach to the phenomenology is parasitic on an action-theoretical approach. In this section, we justify this contention by sketching how a theory of functions can be derived from our theory of artifact action; elsewhere, we have shown this in considerable detail.[19] In this way,

the phenomenological argument of Sections 1 through 3 is supplemented by a conceptual argument.

We arrived at our action-theoretical definition of function ascriptions by combining elements from three types of function theories. We called these types intentionalist function theories, causal-role theories, and evolutionary theories. And since the function theory based on our definition can be seen as an amalgam of these three types, we called it the *ICE function theory*. Our definition reads:

> The capacity to ϕ is ascribed as a function to an artifact x by an agent a, relative to a use plan p for x and relative to an account A, iff:
>
> I. the agent a has the belief that x, when manipulated in the course of execution of p, has the capacity to ϕ, and the agent a has the belief that if this execution of p leads successfully to its goals, this success is due, in part, to x's capacity to ϕ.
>
> C. the agent a can justify these two beliefs on the basis of A; and
>
> E. the agents d who developed p have intentionally selected x for the capacity to ϕ and have intentionally communicated p to other agents u.

We thus take a function not as a simple property of an artifact but as a feature an agent a ascribes to an artifact relative to a use plan for that artifact and relative to an account A on which the agent in part bases the ascription. Our definition is partly normative and partly descriptive. On the one hand, we think that many examples of actual function ascriptions fit our definition; on the other hand, there are clearly some that do not. We take a normative stance towards the latter cases, evaluating them as "ungrounded" or invalid function ascriptions. To put it differently: the I, C, and E-clauses are conditions for valid function ascriptions. The I-condition, derived from intentionalist theories, expresses that function ascriptions by an agent a should be based on two beliefs of a: that the artifact has the capacity to ϕ when it is manipulated according to the plan, and that the artifact by this capacity contributes to realizing the goals of the plan. Moreover, it is insufficient that the agent merely believes that an artifact contributes to the success of a use plan by the capacity it is ascribed as a

function; the agent should be able to justify these beliefs by explanations, experience or testimony. This is expressed by the C-condition. Finally, the E-condition, derived from evolutionary theories, expresses that the use plan relative to which the function is ascribed to the artifact should indeed be a use plan *for* that artifact with the capacity to ϕ. The agents d who have developed the plan should have deliberately included an action in which the artifact is manipulated for its capacity to ϕ. And these agents d should have communicated the plan to other agents u—the potential users of the artifact—as a use plan for the artifact. The agents d are typically the designers of the artifact. But they also may be redesigners that developed only a new use plan for a pre-existing artifact—the Aspirin-as-blood-clots-prevention example—and these agents d may be innovative users that developed a new use plan by trial and error—the beer-as-slug-bait example.

The ICE definition allows that the agent a that ascribes the function is one of the agents d that developed the use plan, or one of the (potential) users u to which the plan is communicated. If the agent a is a designer of the artifact or a (professional) redesigner of the use plan for the artifact, then the justification required by condition C consists typically of explanations based on scientific and technological knowledge.[20] If the agent a is an innovative user, the justification required by condition C consists typically of experience. And if a is a potential user, the justification can be either experience or testimony by the original designers that developed and communicated the use plan to the user.

In short, our theory of function features use plans, justification, and communication as central concepts. Roughly speaking, an artifact function is any role played by an artifact in a use plan that is justified and communicated to prospective users. Hence, functions are plan-relative: it makes no sense to ascribe functions to an object that is not, metaphorically speaking, embedded in a use plan.

Given this derivation of artifact functions from a theory of artifact actions, the latter *replaces* a function-oriented philosophy of artifacts instead of merely supplementing it. It may be possible to account for the phenomenology of artifact use in terms of functions, but it is fundamentally described in terms of actions—as we have done in Section 3. We devote the final part of this paper to exploring, very tentatively, the consequences of this shift from functions to actions for a metaphysics of artifacts and

their functions. What, on our ICE theory, does it mean to say that an artifact *has* the function to ϕ, and what is the essence of an artifact, if not its function?

First of all, let us note that our theory does not lead directly to answers to these questions. It is primarily a theory of function ascriptions, i.e., a theory that spells out the conditions an agent has to meet in order to ascribe functions in a valid manner. Therefore, there is a gap between the results of our theory and the "real" functions of artifacts, akin to the familiar difference between warranted beliefs and true knowledge.

Let us suppose for the moment that this gap is negligible—which is not implausible, since the domain of technical artifacts seems constituted by human actions and beliefs. Then, artifact functions turn out to be capacities highlighted relative to a plan. Ascribing the function to ϕ to an artifact entails having an appropriately justified belief that it has a capacity to ϕ—a capacity that the artifact may in fact lack, as witnessed by some kinds of malfunctioning. Hence, relative to a use plan, to the realization of which the capacity to ϕ is supposed to contribute, at least one capacity of the artifact is *highlighted* among the multitude of capacities that it actually or supposedly has. Relative to the standard use plan, the capacities of beer to quench thirst and to cause slight intoxication are highlighted among, for instance, its capacity to go flat when salted or its capacity to attract slugs. Relative to the alternative use plan of organic gardeners, the latter capacity is highlighted.

To put it more succinctly: On our theory, an artifact function is a capacity, supposed or actual, which has a preferential status in the context of certain actions and beliefs. It is therefore a highly relational property, which supervenes on both the actual physical makeup of an artifact and on the beliefs and actions of human agents, designers as well as users. This reflects the context-sensitivity of function ascriptions, a fact that has gone unnoticed in most of the function-oriented literature, but which our theory explains to a significant extent—through the context-sensitivity of rational use plans.

A closely related result concerns the claim, possibly underlying most function-oriented philosophies of artifacts, that artifacts are essentially objects with a function. On our theory, this claim overrates the importance of functions. After all, the ICE definition presented at the start of this section

effectively reduces the notion of function to, among other things, justified beliefs and communicated use plans. Hence a "function essentialist" who takes seriously our definition would be led to the claim that artifacts are primarily objects that play a role in a certain collection of actions and mental states—which has some surprising consequences. To illustrate this, suppose that a screwdriver is used to drive a screw into two pieces of wood, by hammering at it with the handle. If functionality is used as an individuating condition for artifacts, in line with its alleged essential status, this screwdriver is placed in the same class as screwdrivers used in the standard way. The non-standard use is, in this case, in accordance with the proper function of screwdrivers "to drive screws into materials." Even if "driving screws into materials by hammering" would be considered an accidental function different from the proper function, one could regard the *proper* function as an individuating condition. On our conceptual analysis, a screwdriver is primarily described as an object for which there exists a communicated, well-established use plan, execution of which is supposed to lead to a goal state—attachment by means of a screw. This would lead to more stringent individuating conditions for artifacts. Given its way of using, the object used non-standardly in the episode described above is not a screwdriver, but an oddly shaped, cumbersome "screw-hammer"—or perhaps a screwdriver used *as* a hammer; i.e., an object used in accordance with an alternative use plan.[21] Identifying artifacts by their function is, on our approach, surely convenient in many situations, but leaves out relevant information in others, as witnessed by the screw-hammer. Functions appear to specify only the goal state to be realized, and do not determine the way in which this state ought to be attained: they indicate a class of "equi-destinal" use plans, to coin a phrase. They are too indefinite to be of use in individuating artifacts, although they may serve other purposes.

Summing up, we have presented two arguments against function-oriented philosophies of artifacts. Our first, phenomenological argument showed that a central aspect of the phenomenology of artifact use cannot be described in terms of a distinction between proper and accidental functions, and that an action-theoretical account yields a rich and adequate description. Our second, conceptual argument showed that a theory of artifact functions can be derived from a theory of artifact actions. Given these arguments, it may still be possible to defend the claim that functions are the essence of artifacts—an essence which is then phenomenologically

inadequate and conceptually reducible. We, however, think that our arguments call for action.

Wybo Houkes

Eindhoven University of Technology

Pieter Vermaas

Delft University of Technology

NOTES

*We would like to thank the members of the Departments of Philosophy at Delft University of Technology and at the State University of New York at Buffalo for discussions and their useful comments. Research for this paper was part of the program "The Dual Nature of Technical Artifacts," which is supported by the Netherlands Organization of Scientific Research (NWO).

1. One recent contribution to the metaphysics of artifacts, Wiggins (2001, ch. 3), identifies functions as their nominal essence, without analyzing the notion of function or considering the phenomenology of artifact use. A notable exception is Searle's (1995) theory of functions, in which functions are not taken as intrinsic to artifacts but as observer relative; on Searle's theory, functions are features that agents impose on artifacts.

2. "Very likely the central distinction of this analysis is that between the *function* of something and other things it does which are *not* its function. . . . This is sometimes put as the distinction between a function and something done merely 'by accident'." (1973, p. 141)

3. E.g., "I have said that the definition of 'proper function' is intended to explain what it is for an item to *have* a function or purpose, but not what it is for an item to function *as* something." (Millikan 1989, p. 20)

4. More precisely, Preston argues that a function/accident distinction as desired by Wright can be drawn in an account of proper functions and is impossible to draw in an account of system functions (1998, § I).

5. E.g., Preston (2003).

6. Both examples are variations on a common objection against Cummins's (1975) causal-role theory of functions. Proponents of etiological theories usually point out that this theory cannot make the required proper/accidental distinction within the domain of functions. We agree. But the examples show that the objection has a broader scope: a theory of proper function that analyses alternative use in terms of non-proper features may have a problem similar to that of Cummins's theory, in that it cannot distinguish use of a feature from mere behavior of an object. In other words: theories of proper functions usually leave alternative use unanalyzed, while our examples show that there are differences to be made.

7. The full account is presented in, e.g., Houkes, Vermaas, *et al.* (2002).

8. It is indifferent to our purpose whether Bratman's argument (1987, ch. 2) that stable intentions *require* planning holds true. We only want to point out the role played by deliberation and planning of action sequences in everyday life—all the better if there would be an *a priori* argument for a planning approach in the philosophy of action.

9. We invite less liberally inclined readers to impose additional conditions on the type of object or manipulation, in order to distinguish use plans within the category of plans in general—the extension of our term 'use plan' does not concern us here, as long as it includes paradigmatic cases such as the use of a phone or car.

10. Cf. Pollock (1995, § 5.3) for a method of evaluating plans by calculating utilities.

11. These standards are taken from Bratman (1987, § 3.2).

12. The conditions for type-identity of plans are hard to spell out in detail. In many cases, two different sets of actions may count as the same plan. Is driving a car and checking the tire pressure before starting the car a different plan than checking the tire pressure when the car has been started? Or even different than checking this pressure only when one thinks there might be something wrong with the car? This vagueness in the type-identify of plans transfers to the notion of standard use.

13. This account requires a standard for determining whether the plan executed by the user is sufficiently like the designed use plan. Optimally, this would be based on a measure of overlap between use plans, applied to the designed and executed plans. This allows for an intuitively plausible, gradual distinction between standard and non-standard use.

14. In case the slugs plan was developed on the basis of chemical and biological knowledge of beer and slugs and on the basis of extensive tests, we would be bound to call this development "designing," similar to the Aspirin case discussed in Section 1. When communicated to prospective users, this plan amounts then immediately to standard use of beer by our approach.

15. There are many ways to distribute the blame for ineffective use of an artifact. The context-sensitivity of use plans and their standards of rationality makes clear that, for instance, the physical circumstances may be inappropriate—perhaps in such a way that neither the user nor the designer is to blame for the resulting lack of success in artifact use.

16. This account, which explains properness in terms of standards for practical rationality, ignores the social connotations or "customization" of proper use—which is not just defeasibly rational, but also socially accepted. The underlying social mechanism may reflect the division of labor mentioned earlier: designers have the social role of providing society with useful items; using these items in the ways that they indicated respects this social role. Alternatively, properness may appeal to standards other than practical effectiveness; standards which have a strong social component, such as safety, hygiene, or durability. In both respects, our basic, designer-centered plan theory needs to be supplemented with accounts of social authority and responsibility.

17. Etiological theories come in two basic varieties (cf. Vermaas and Houkes [2003]): those that stress long-term reproduction, e.g., in natural selection, and those that stress one-shot production, e.g., in intentional selection (the etiological theories of Neander [1991] and Millikan [1984]); both consist of a reproduction and a production part). Here, we focus on reproduction theories; non-reproduction theories are not acceptable for different reasons —one may even wonder whether they can make a distinction between proper and accidental functions in the first place (cf. Preston [2003]).

18. The capacities associated with the functions of material objects, such as artifacts and biological organs, refer in Cummins's theory to physical properties and/or the dispositions of those objects. But capacities do not always have this physical meaning; capacities can also have a more intentional character, as when Cummins speaks about the functions of actions as part of procedures and steps within recipes. In this paper we adopt Cummins's terminology. Hence, when we speak of capacities of artifacts, we refer to some of their physical properties and/or dispositions.

19. Houkes and Vermaas (2003).

20. The category of technological knowledge requires further elaboration to prevent circularity—it will not do to characterize it as "the knowledge possessed by engineers." A first classification of kinds of technological knowledge may be found in Vincenti (1990, pp. 207–22).

21. One may object that one could, for instance, describe both the activity of hammering a screw and of turning it as "driving," hence, the objects may both justifiably be called "screwdrivers." It may always be possible to find such encompassing descriptions of standard and alternative use. The point we are trying to bring across here is that, intuitively, there are different ways of describing the object used in both cases, and that this difference can be captured in terms of plans, not of functions. Still, an analysis of individuating artifacts beyond this intuitive stage would lead into the problem of the level of description of either plans or functions, which lies beyond the scope of the present paper.

REFERENCES

Bratman, M., 1987. *Intentions, Plans, and Practical Reason.* Cambridge, MA: Harvard University Press.

Cummins, R., 1975. "Functional Analysis," *The Journal of Philosophy* **72**: 741–65.

Dipert, R. R., 1993. *Artifacts, Art Works, and Agency.* Philadelphia, PA: Temple University Press.

Houkes, W. and P. E. Vermaas, 2003. "Artefact Functions: A Domain Dependent, Use Plan Analysis," Delft University of Technology manuscript.

Houkes, W., P. E. Vermaas, K. Dorst, and M. J. de Vries, 2002. "Design and Use as Plans: An Action-Theoretical Account," *Design Studies* **23**: 303–20.

Millikan, R. G., 1984. *Language, Thought, and Other Biological Categories: New Foundations for Realism.* Cambridge, MA: M.I.T. Press.

_____, 1989. "In Defense of Proper Functions," in: Millikan, R. G., 1993. *White Queen Psychology and Other Essays for Alice.* Cambridge, MA: M.I.T. Press, 13–29.

Neander, K., 1991. "Function as Selected Effects: The Conceptual Analyst's Defense," *Philosophy of Science* **58**: 168–84.

Pollock, J. L., 1995. *Cognitive Carpentry: A Blueprint for How to Build a Person.* Cambridge, MA: M.I.T. Press.

Preston, B., 1998. "Why Is a Wing Like a Spoon? A Pluralist Theory of Functions," *The Journal of Philosophy* **95**: 215–54.

_____, 2003. "Of Marigold Beer—A Reply to Vermaas and Houkes," *British Journal for the Philosophy of Science* **54**: 601–12.

Searle, J. R., 1995. *The Construction of Social Reality.* New York: Free Press.

Vermaas, P. E. and W. Houkes, 2003. "Ascribing Functions to Technical Artifacts: A Challenge to Etiological Accounts of Functions," *British Journal for the Philosophy of Science* **54**: 261–89.

Vincenti, W., 1990. *What Engineers Know and How They Know It.* Baltimore, MD: Johns Hopkins University Press.

Wiggins, D., 2001. *Sameness and Substance Renewed.* Cambridge: Cambridge University Press.

Wright, L., 1973. "Functions," *The Philosophical Review* **82**: 139–68.